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COPHASED ANTENNA ARRAY WITH ELECTRICAL SCANNING, (U)  
JAN 79 Y A ANFILOV, I T GOVORKOV  
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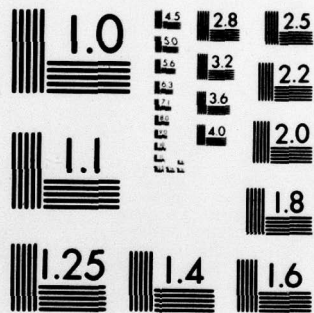
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## FOREIGN TECHNOLOGY DIVISION



COPHASED ANTENNA ARRAY WITH ELECTRICAL SCANNING

by

Ye. A. Anfilov, I. T. Govorkov, et al.



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## EDITED TRANSLATION

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By: Ye. A. Anfilov, I. T. Govorkov, et al.

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# U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<b><i>А а</i></b>	A, a	Р р	<b><i>Р р</i></b>	R, r
Б б	<b><i>Б б</i></b>	B, b	С с	<b><i>С с</i></b>	S, s
В в	<b><i>В в</i></b>	V, v	Т т	<b><i>Т т</i></b>	T, t
Г г	<b><i>Г г</i></b>	G, g	У у	<b><i>У у</i></b>	U, u
Д д	<b><i>Д д</i></b>	D, d	Ф ф	<b><i>Ф ф</i></b>	F, f
Е е	<b><i>Е е</i></b>	Ye, ye; E, e*	Х х	<b><i>Х х</i></b>	Kh, kh
Ж ж	<b><i>Ж ж</i></b>	Zh, zh	Ц ц	<b><i>Ц ц</i></b>	Ts, ts
З з	<b><i>З з</i></b>	Z, z	Ч ч	<b><i>Ч ч</i></b>	Ch, ch
И и	<b><i>И и</i></b>	I, i	Ш ш	<b><i>Ш ш</i></b>	Sh, sh
Й й	<b><i>Й й</i></b>	Y, y	Щ щ	<b><i>Щ щ</i></b>	Shch, shch
К к	<b><i>К к</i></b>	K, k	Ъ ъ	<b><i>Ъ ъ</i></b>	"
Л л	<b><i>Л л</i></b>	L, l	Ы ы	<b><i>Ы ы</i></b>	Y, y
М м	<b><i>М м</i></b>	M, m	Ь ь	<b><i>Ь ь</i></b>	'
Н н	<b><i>Н н</i></b>	N, n	Э э	<b><i>Э э</i></b>	E, e
О о	<b><i>О о</i></b>	O, o	Ю ю	<b><i>Ю ю</i></b>	Yu, yu
П п	<b><i>П п</i></b>	P, p	Я я	<b><i>Я я</i></b>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ё in Russian, transliterate as yë or ë.

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh <sup>-1</sup>
cos	cos	ch	cosh	arc ch	cosh <sup>-1</sup>
tg	tan	th	tanh	arc th	tanh <sup>-1</sup>
ctg	cot	cth	coth	arc cth	coth <sup>-1</sup>
sec	sec	sch	sech	arc sch	sech <sup>-1</sup>
cosec	csc	csch	csch	arc csch	csch <sup>-1</sup>

Russian	English
rot	curl
lg	log

# COPHASED ANTENNA ARRAY WITH ELECTRICAL SCANNING

Ye. A. Anfilov, I. T. Govorkov, R. V. Gurevich, I. A. Zhuchkin,  
V. D. Kuznetsov, L. K. Olifin

Scanning antenna arrays, made in the form of oscillator emitters irregularly positioned in a row, and arrays with spatial shift of separate emitters in a direction perpendicular to the plane of the array are known.

The proposed cophased antenna array with electrical scanning is distinguished by the fact that, in it, the upper and lower groups (levels) of oscillators are shifted one relative to another along the horizontal in the plane of the array by a value equal to half the distance between the neighboring oscillators in the group.

This permits decreasing the level of the side lobes of the diagram of directivity in the horizontal plane during scanning.

The array consists of emitting cophased short-wave oscillators 1 positioned by groups 2 and 3 at distance  $\lambda_0$ . For ensuring unidirectional radiation, the array is equipped with an aperiodic reflector from horizontal leads or with a tuned reflector.



Control of the directivity diagram in the horizontal plane is accomplished by creating corresponding shifts of phase between the points of groups 2 and 3 with the aid of a phase shifter 4. Phase shifters 5 and 6 for the upper and lower groups of oscillators are made like in the normal present-day antenna arrays.

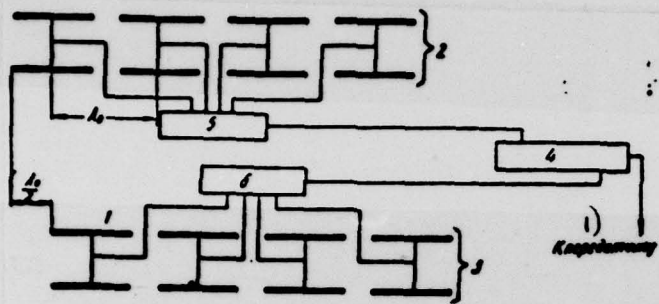
The oscillators have low wave resistance. Equal powers are fed to them. The level of side lobes of the directivity diagram of the array decreases thanks to the shifting of oscillators of the upper group 2 with respect to the oscillators of lower group 3 by a value equal to half of the distance between the neighboring oscillators in the group.

#### Subject of the Invention

A cophased antenna array with electrical scanning, made in the form of symmetrical oscillators positioned in groups and equipped with an aperiodic or tuned reflector, is distinguished by the fact that with the purpose of decreasing the level of side lobes of the directivity diagram in a horizontal plane, the lower group of oscillators is shifted with respect to the upper group along the horizontal in the plane of the array by a value equal to half of the distance between the neighboring oscillators in the group.



Figure. Key: 1 - to the transmitter.



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